

# CO MEASUREMENTS AT THE HIGH-ALPINE SITE JUNGFRAUJOCH, SWITZERLAND

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## Introduction

Three different measurement techniques are currently in use to continuously measure ambient air CO mixing ratios at the global GAW station Jungfraujoch (7° 59' E, 46° 32' N, 3580 m a.s.l., situated in the Central Swiss Alps).

- CO monitor (Horiba) using NDIR technique (since April 1996)
- GC coupled with a reduction gas analyzer (RGA-3)
- GC-FID after passing a methanizer (both since February 2005)

## Non-linearity tests of the GC systems

Extended tests were conducted to determine potential non-linearities of the RGA-3 and the methanizer with subsequent FID detection (see Figure 1).

- a non-linearity was found for the RGA-3 that can be well described with a 4<sup>th</sup> order polynomial
- no non-linearity was found for the GC-FID with precedent CO conversion

## Ambient air comparison

Figure 2 shows two selected 3-day periods of ambient air measurements (preliminary data) at the Jungfraujoch. A good agreement is obtained for all three measurement techniques.

- the CO monitor shows a larger scatter even when considering 10-min averages
- short term pollution episodes can only be seen by the GC systems
- RGA shows too high values during the second presented period due to a (known) downward CO drift in the working standard (as the working standard was chosen to have optimum H<sub>2</sub> conditions)
  - frequent cross-measurements of the standards with different instruments allow tracking the drifts and correcting the data

## Conclusions

- non-linearity has to be checked for high precision analyses
- all three different measurement techniques are in rather good agreement
- (quasi-continuously) CO measurements by gas chromatography feature a higher precision than the NDIR technique
- when using the RGA-3 for simultaneous H<sub>2</sub> and CO measurements great care has to be taken of choosing an appropriate (i.e. stable) standard

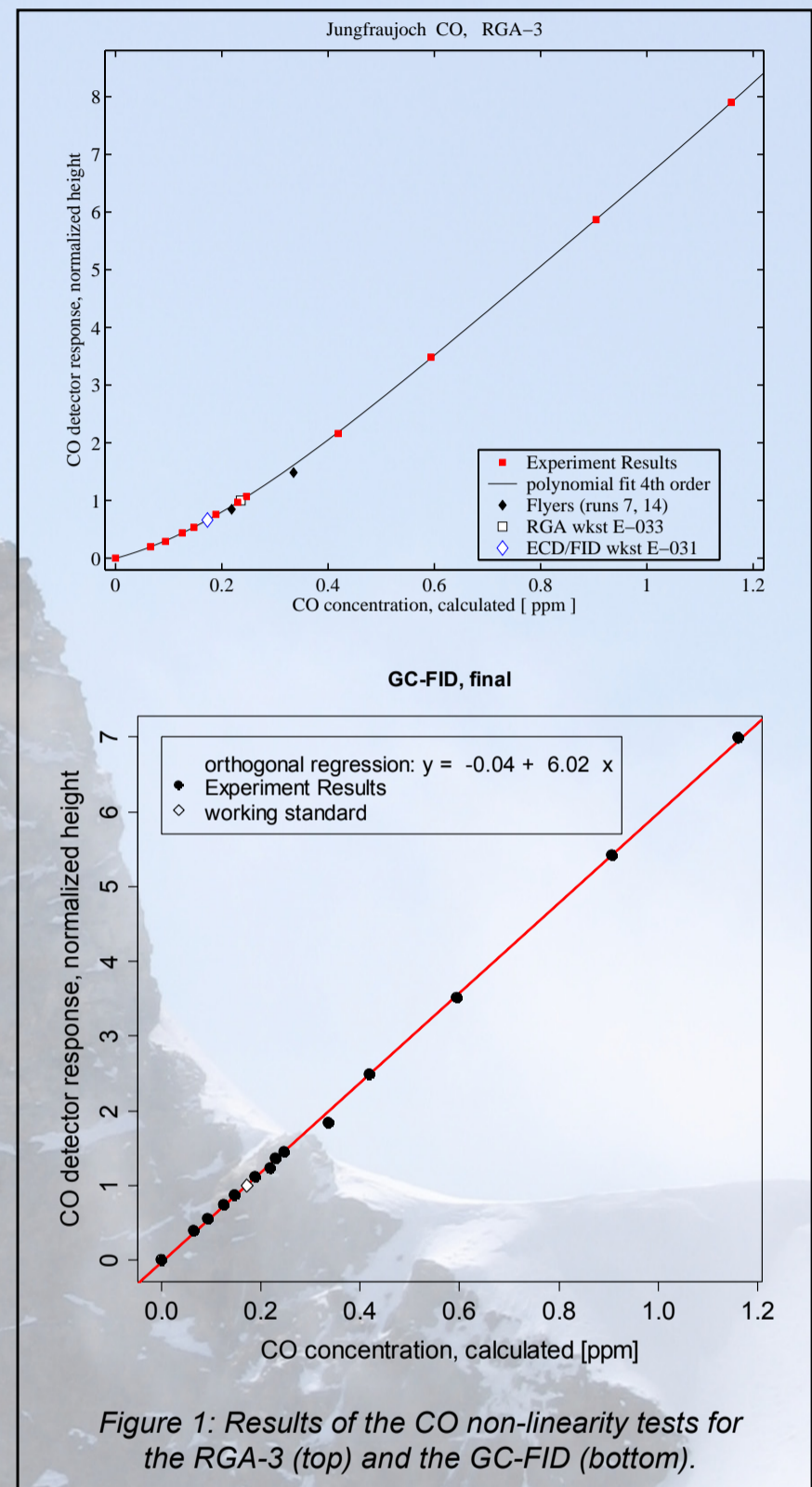


Figure 1: Results of the CO non-linearity tests for the RGA-3 (top) and the GC-FID (bottom).

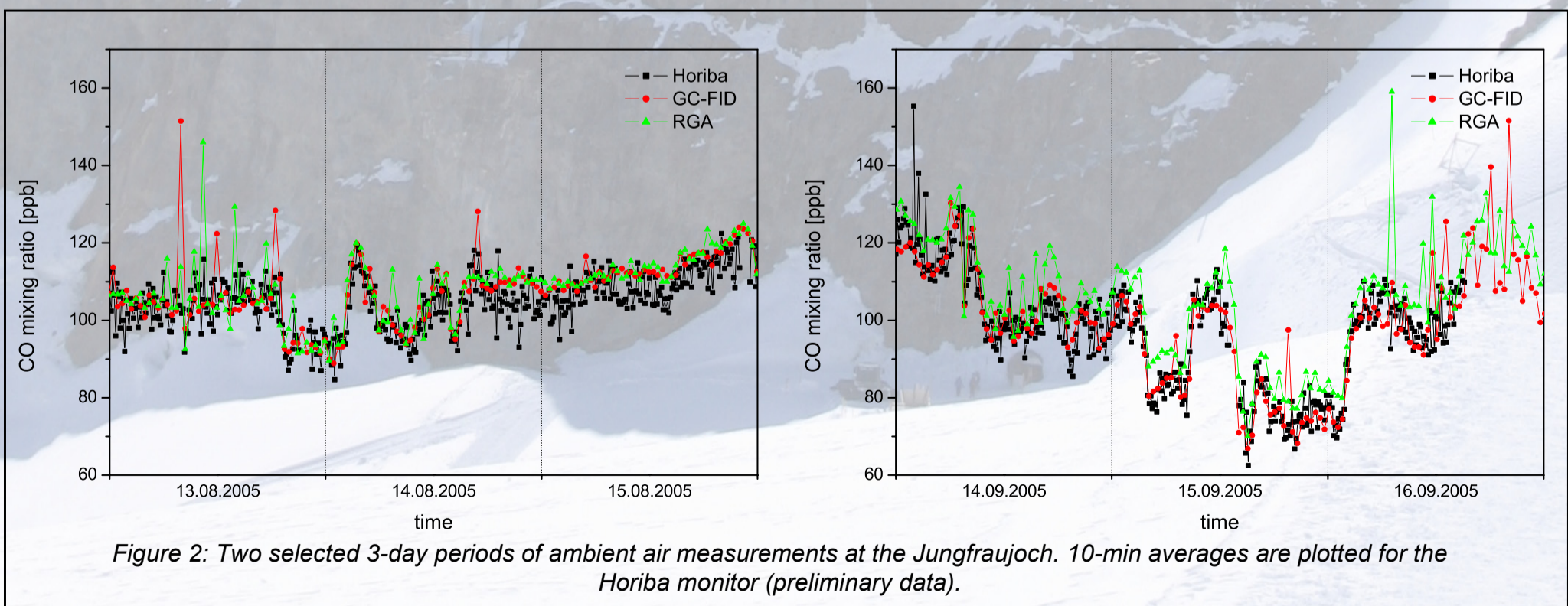


Figure 2: Two selected 3-day periods of ambient air measurements at the Jungfraujoch. 10-min averages are plotted for the Horiba monitor (preliminary data).

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